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(54) USER INTERFACE FOR ELECTRONIC DEVICES

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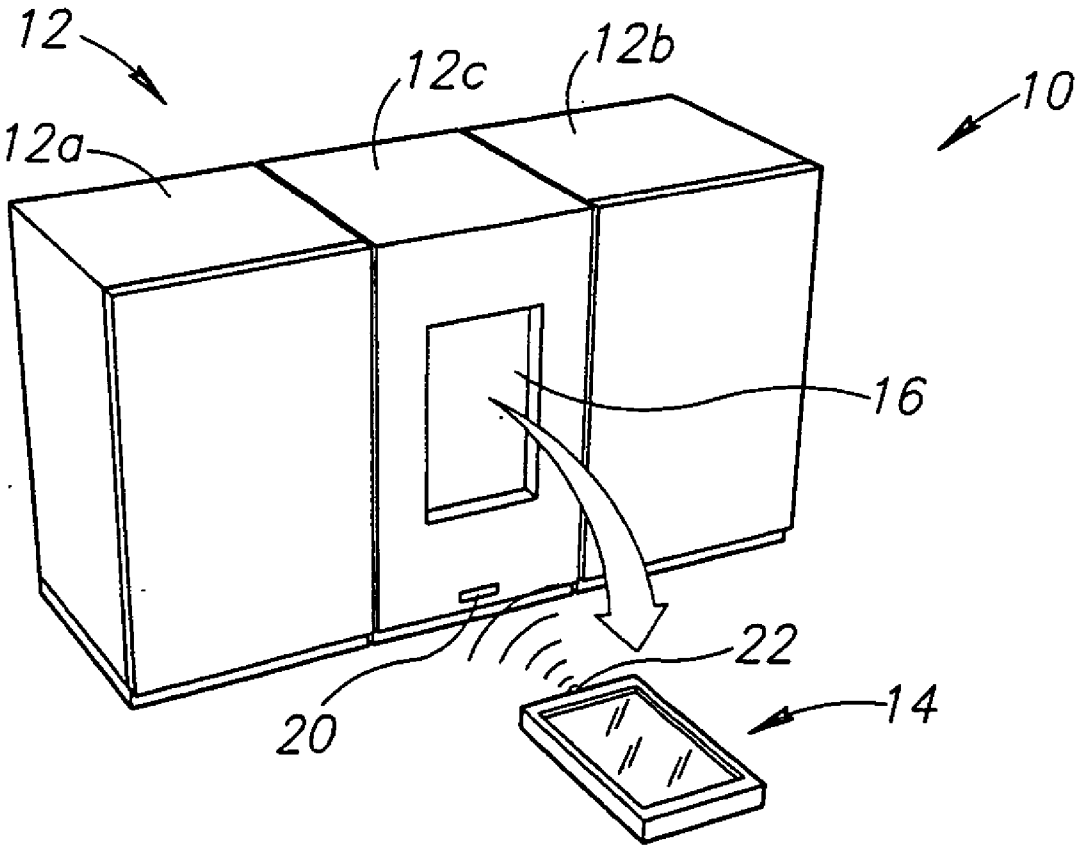
(52) **U.S. Cl.** **345/156**

(57) **ABSTRACT**

A system is disclosed including an electronic device having a case housing an operative portion, such as a sound system, CD Player, or the like. A bay is formed in the case and includes a communication channel interface electrically coupled to the operative portion. The system further includes a portable computer, such as a personal digital assistant (PDA). The portable computer is sized to fit within the bay having a communication channel thereof in data communication with the communication channel interface. The portable computer stores applications including one or more control applications programmed to generate control signals in response to user inputs. Applications may display an interface on a touch screen and receive user inputs therefrom. The control signals are transmitted to the operative portion which responds to the control signals by playing music, adjusting a volume level, and the like.



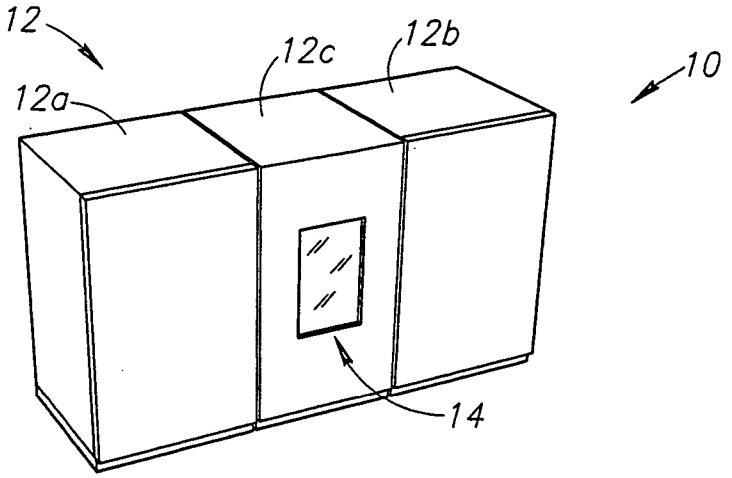


FIG.1A

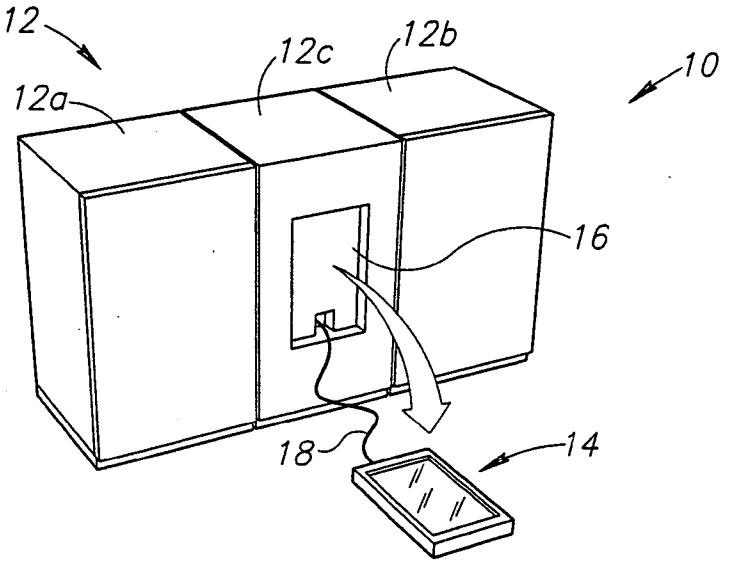


FIG.1B

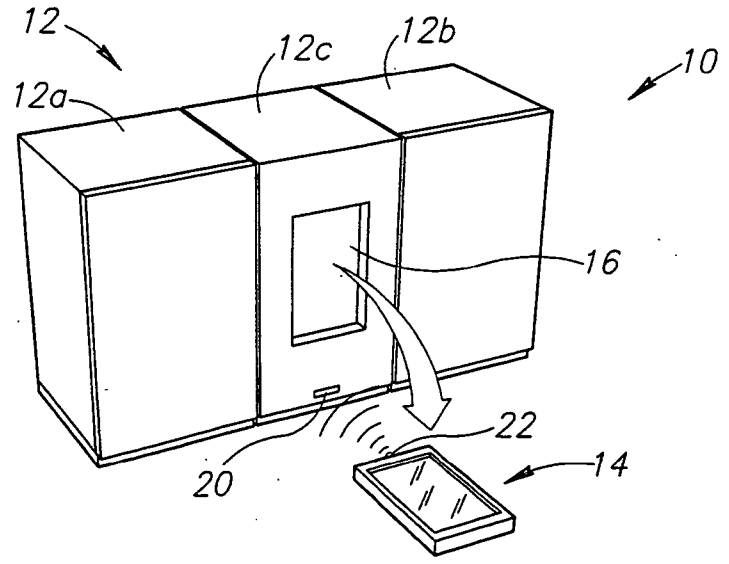


FIG.1C

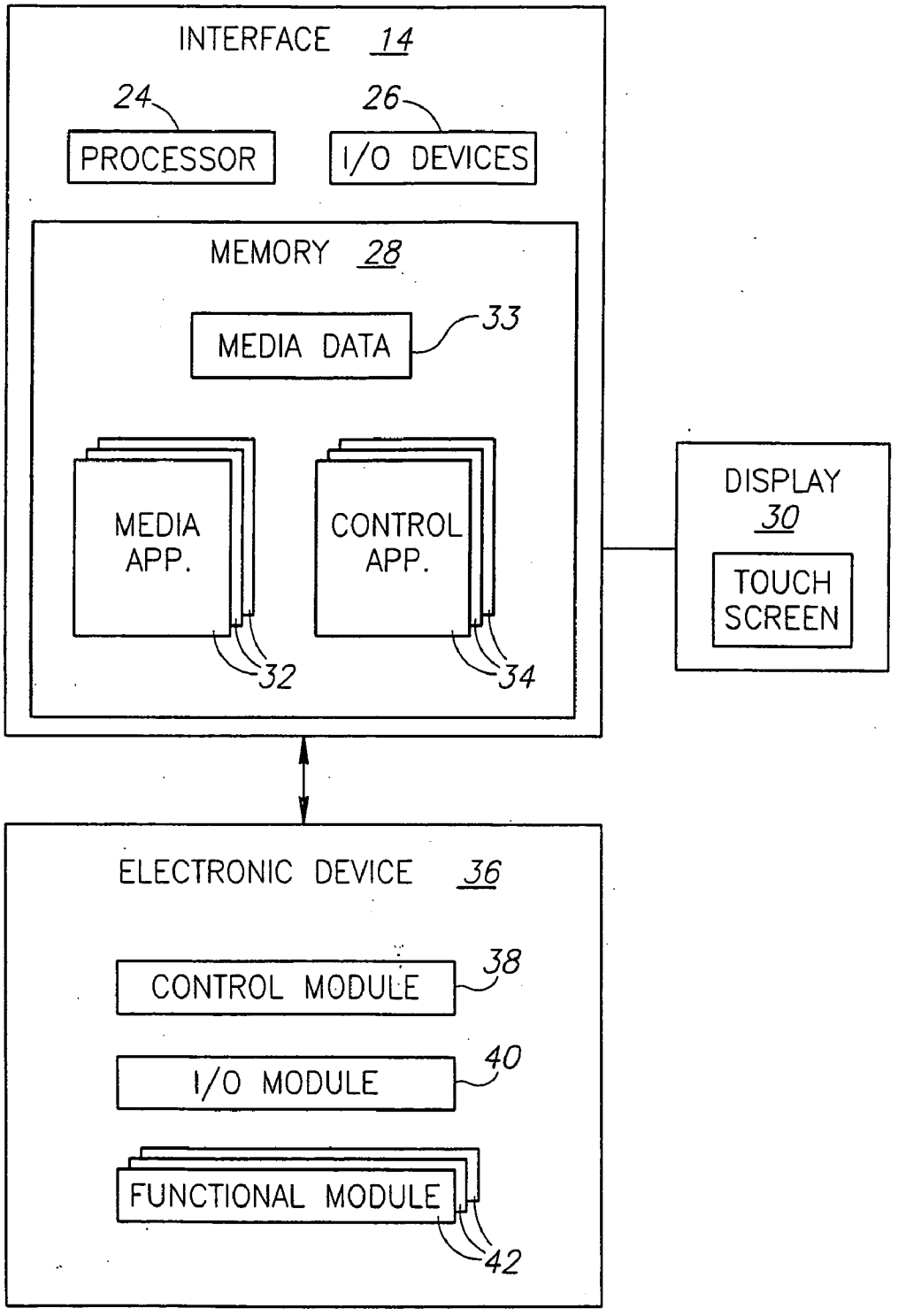

INTERFACE 14
24
PROCESSOR
26
I/O DEVICES
MEMORY 28
MEDIA DATA
33
MEDIA APP.
CONTROL APP.
32
34
DISPLAY 30
TOUCH SCREEN
ELECTRONIC DEVICE 36
CONTROL MODULE
38
I/O MODULE
40
FUNCTIONAL MODULE
42

FIG.2

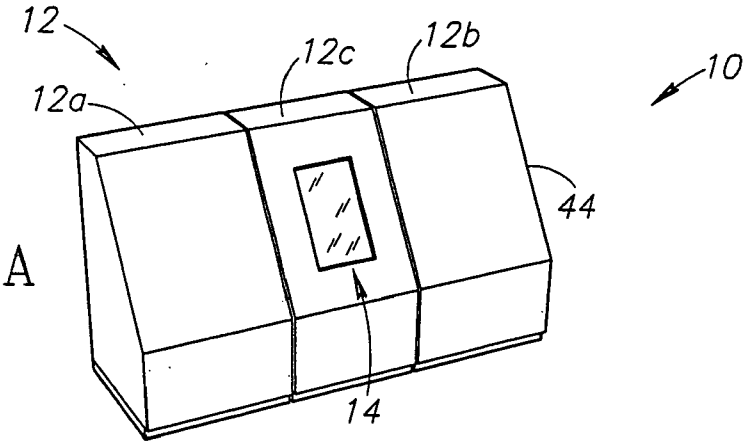


FIG.3A

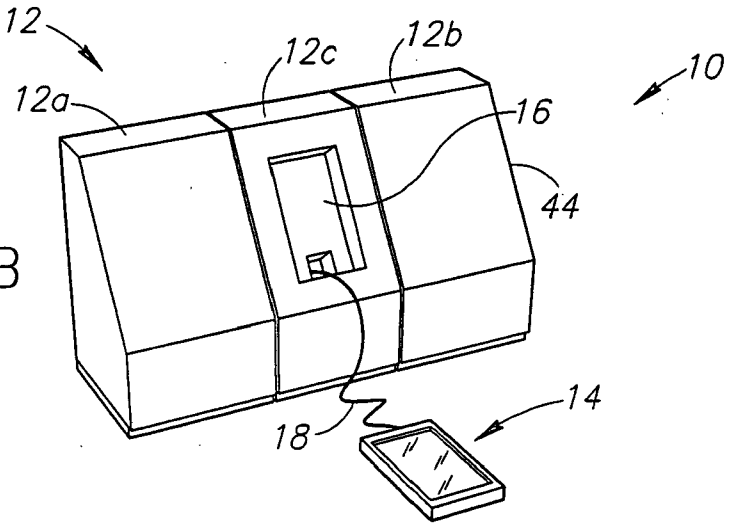


FIG.3B

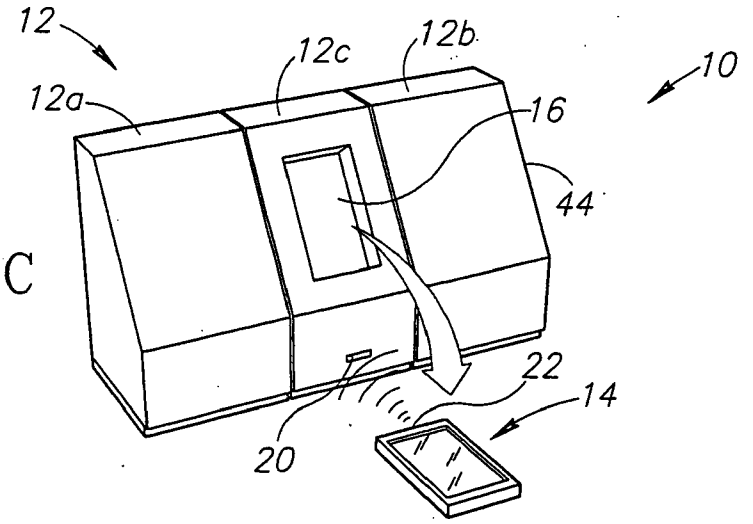


FIG.3C

FIG.4A

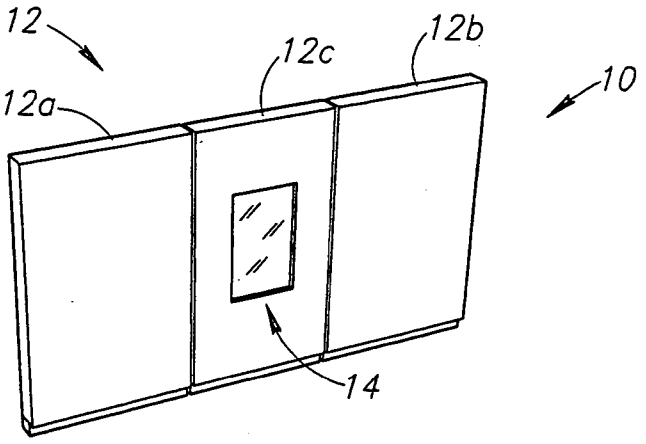


FIG.4B

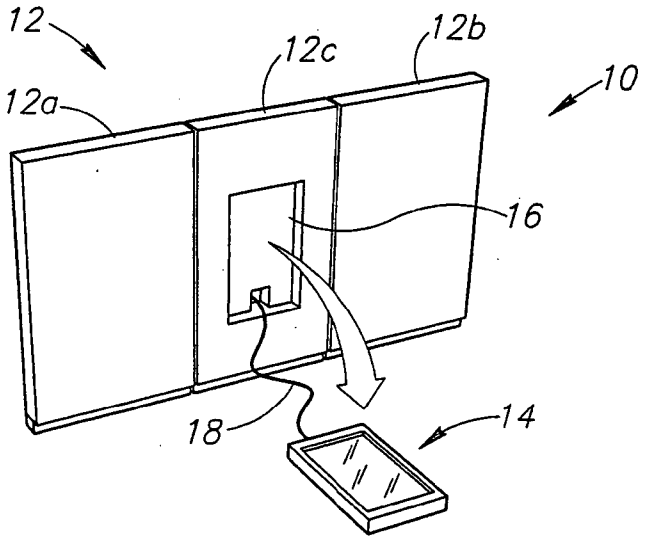
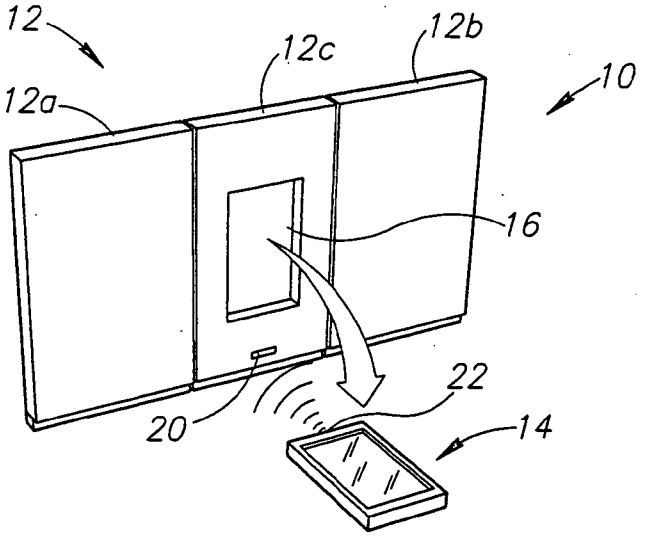


FIG.4C



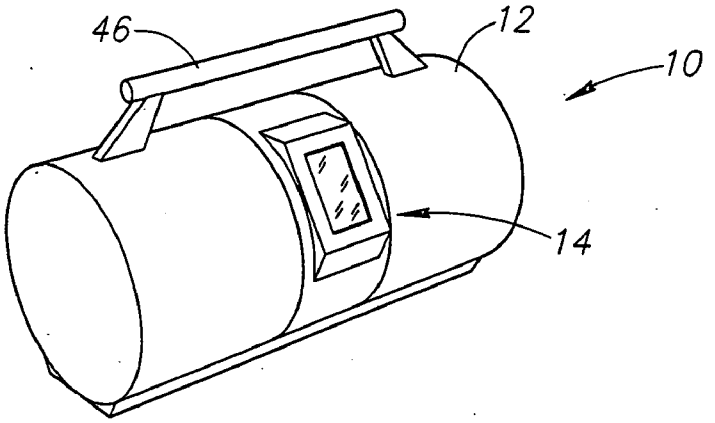


FIG.5A

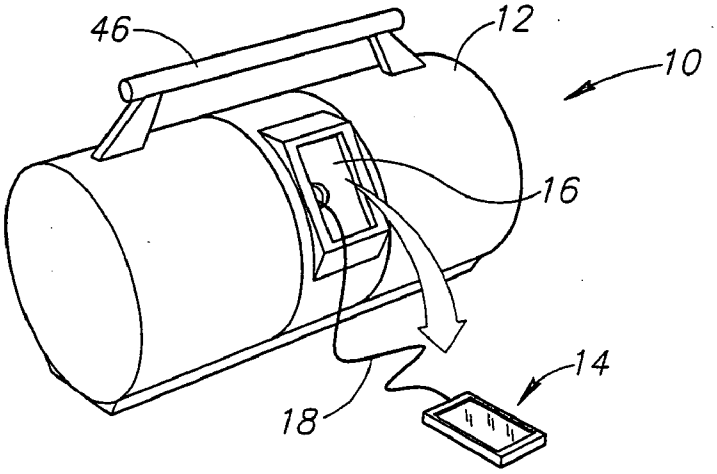


FIG.5B

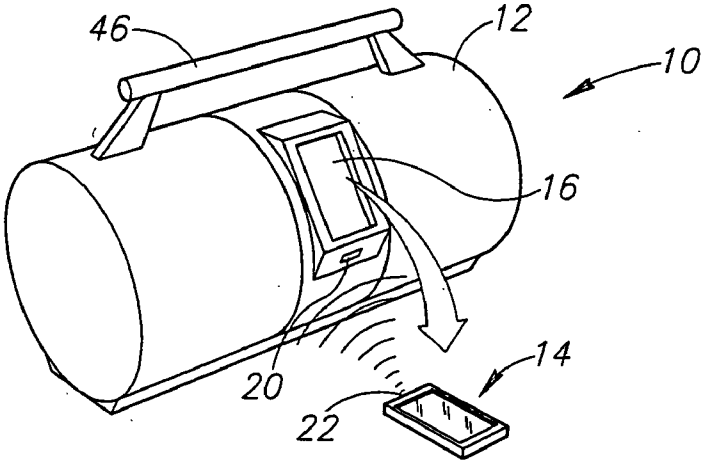


FIG.5C

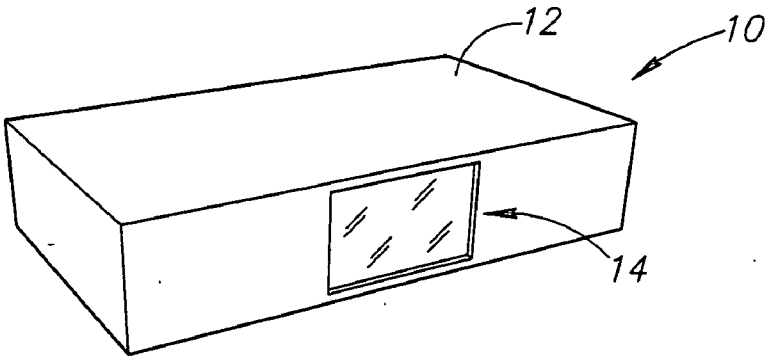


FIG.6A

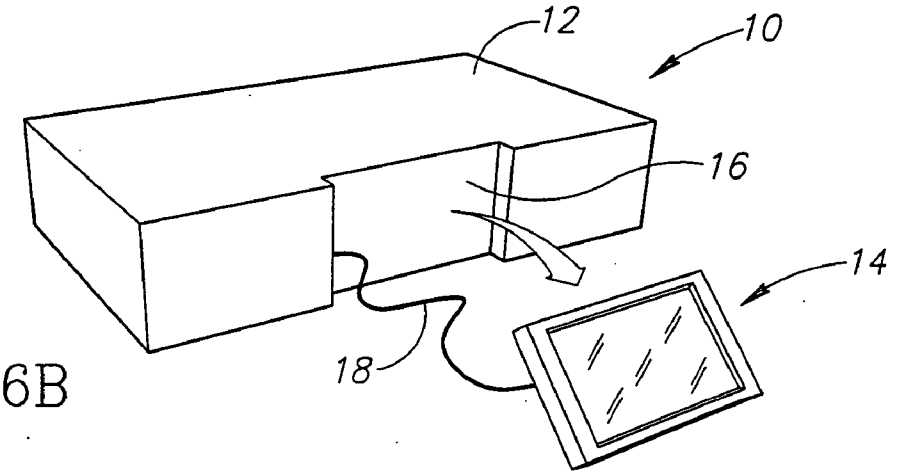


FIG.6B

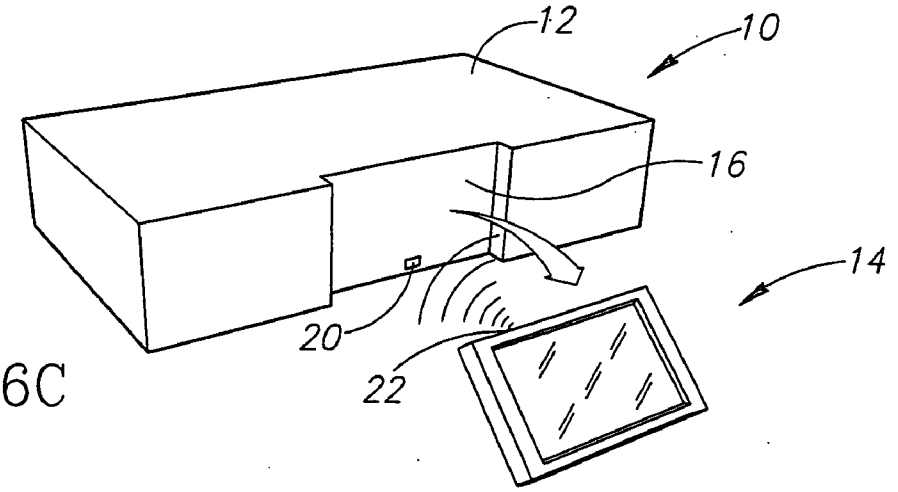


FIG.6C

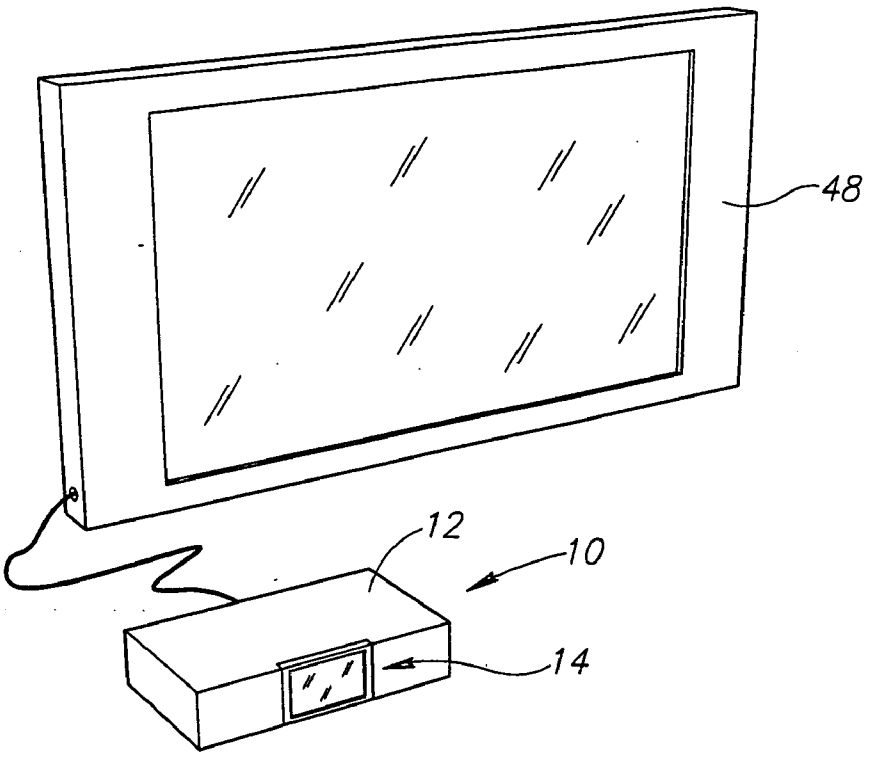


FIG.7A

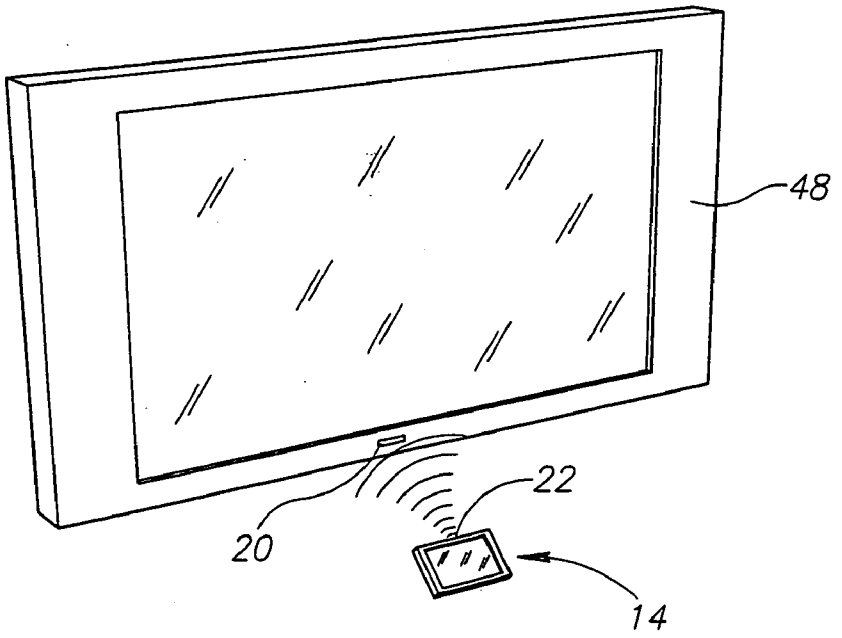


FIG.7B

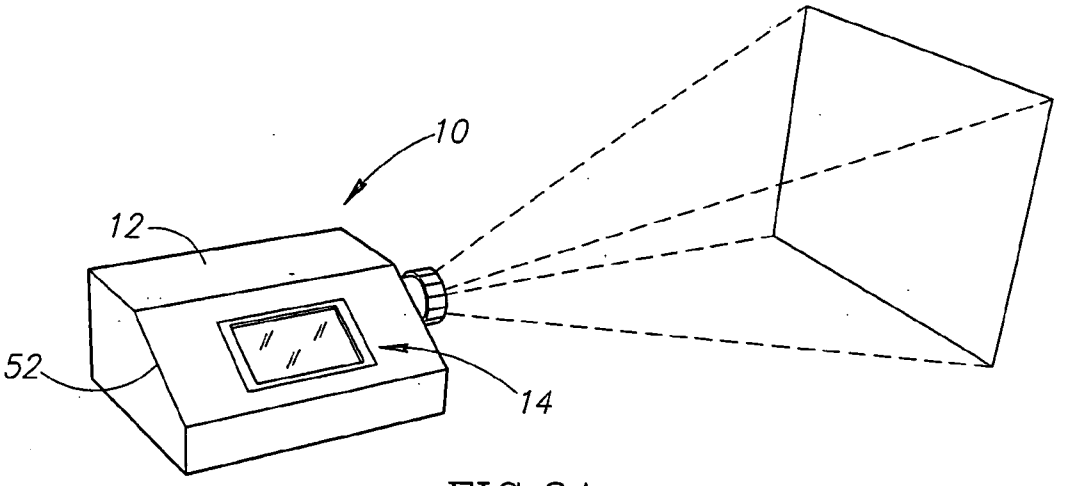


FIG.8A

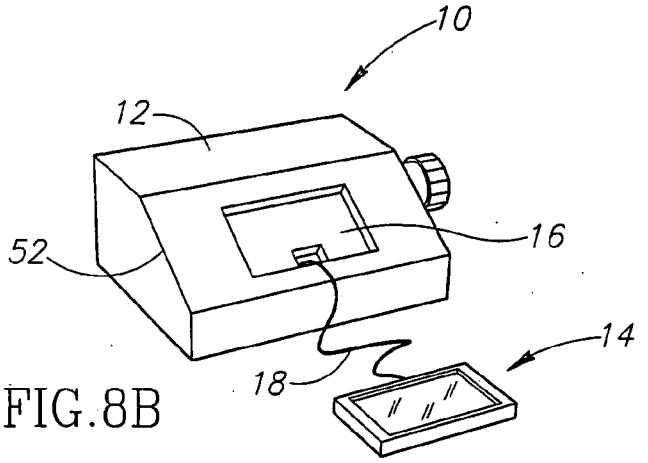


FIG.8B

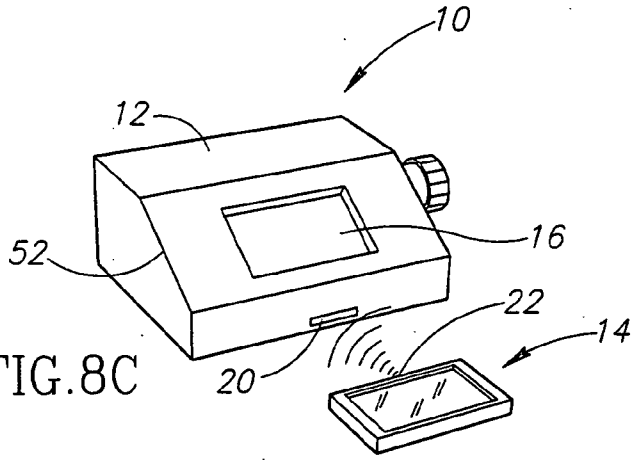


FIG.8C

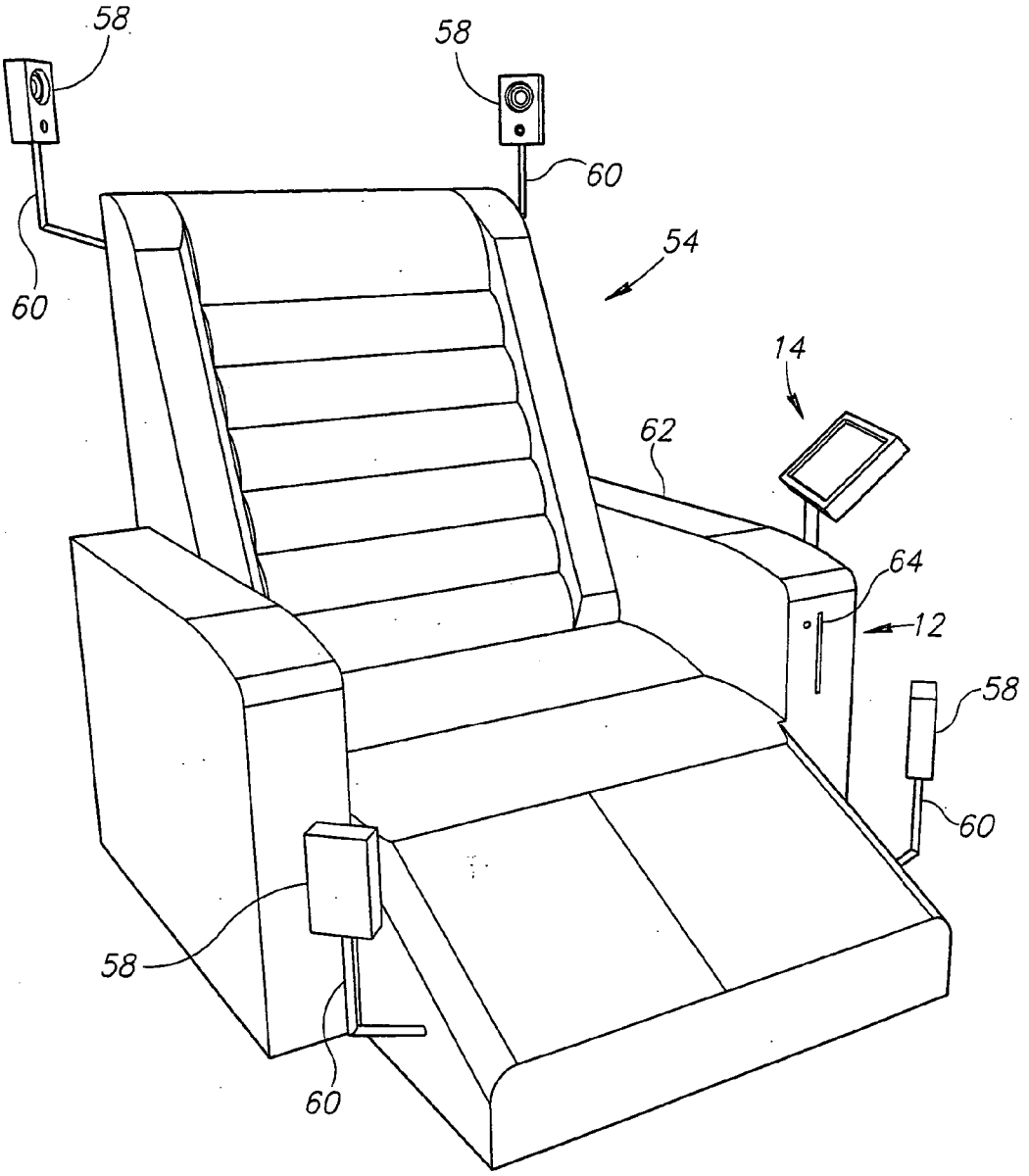


FIG.9A

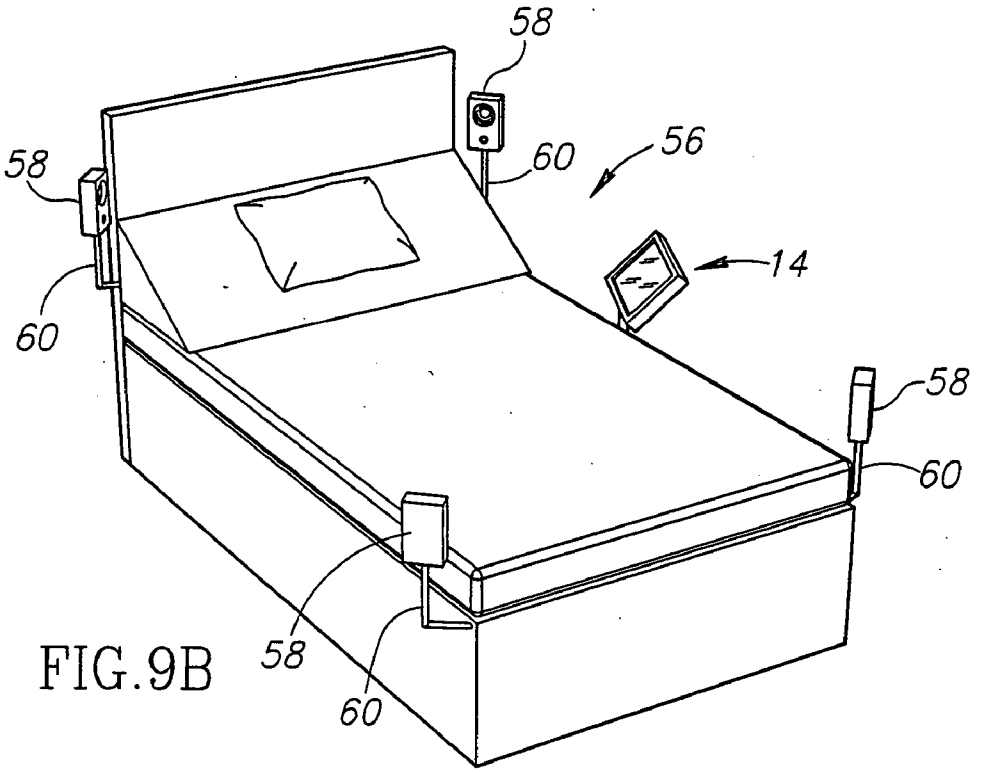


FIG.9B

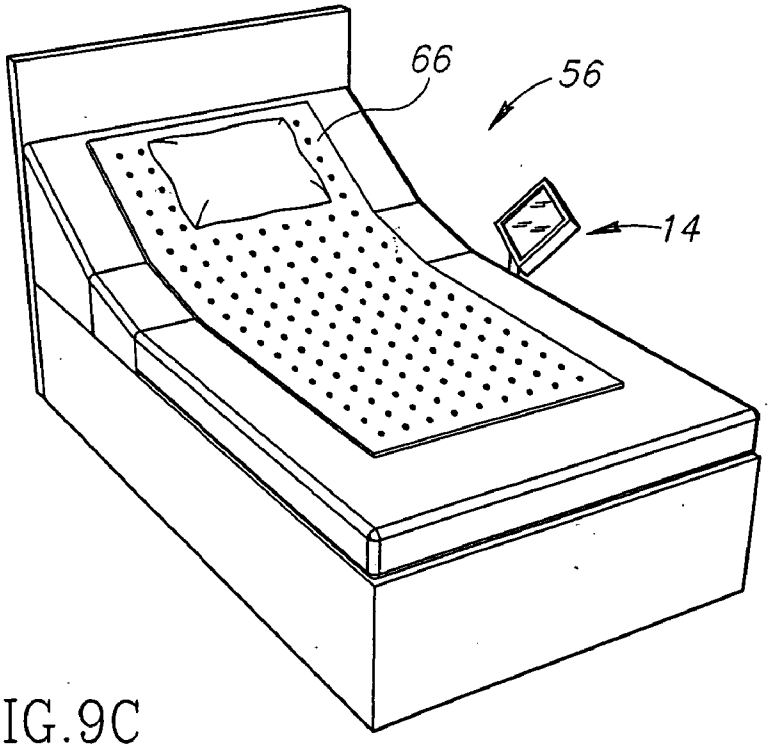


FIG.9C

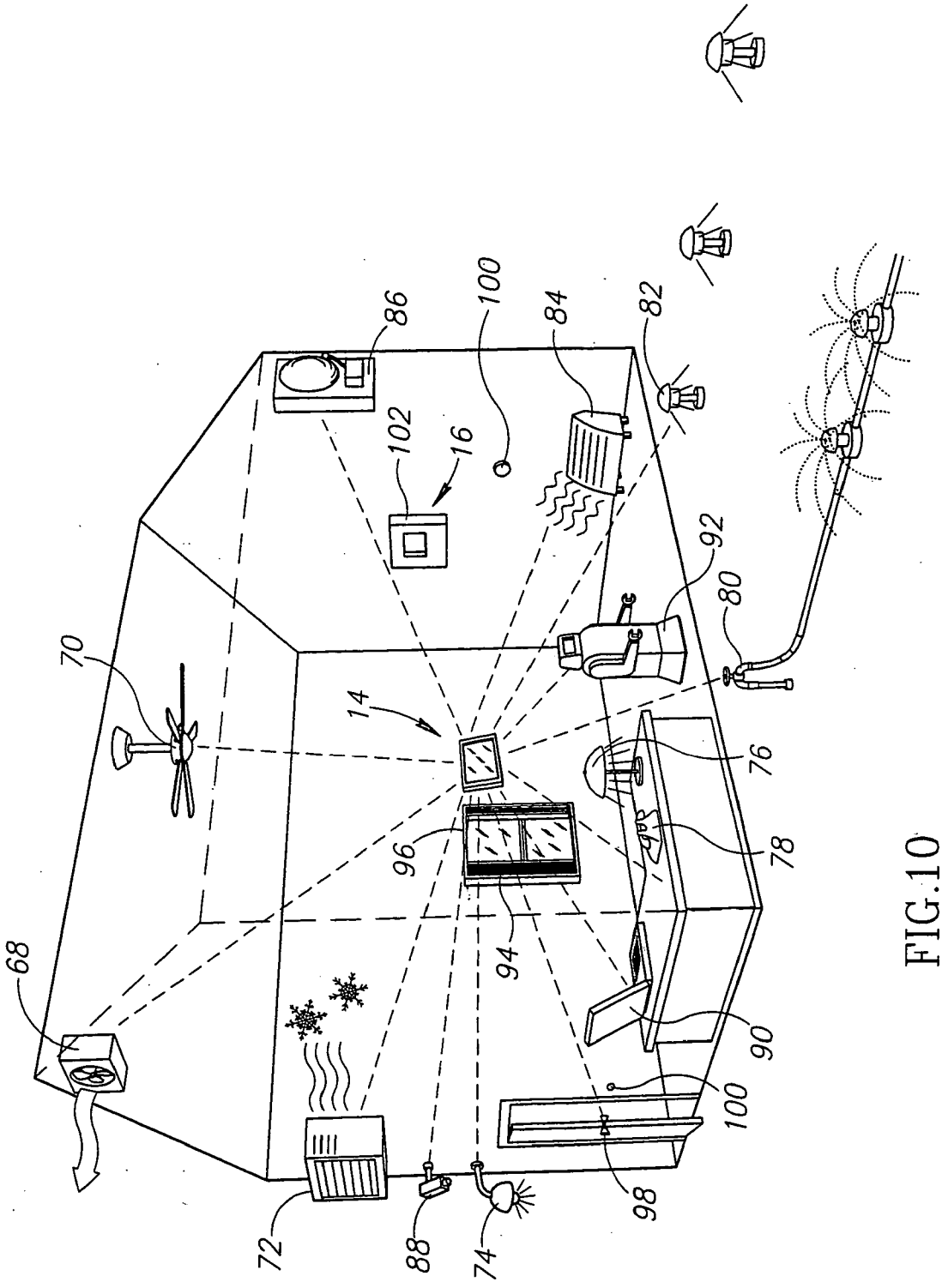


FIG.10

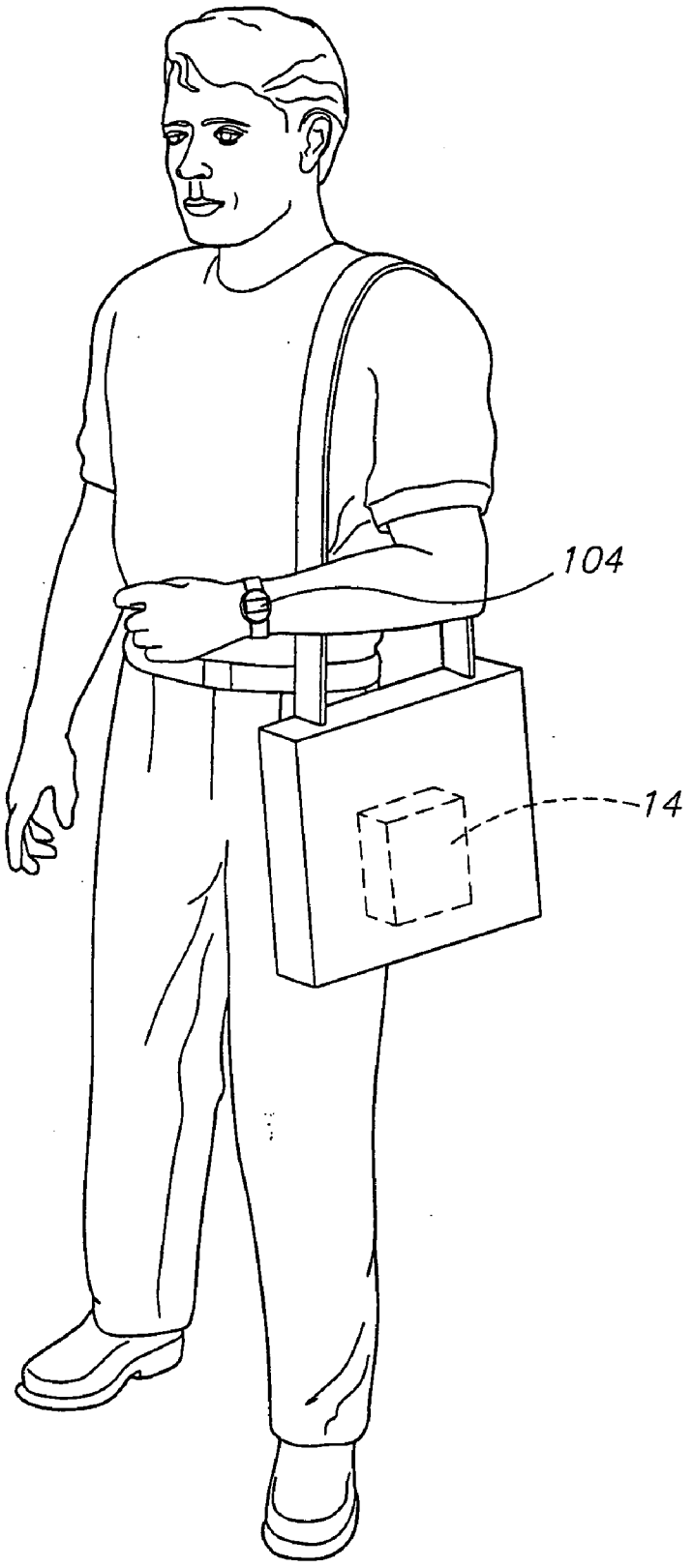


FIG.11

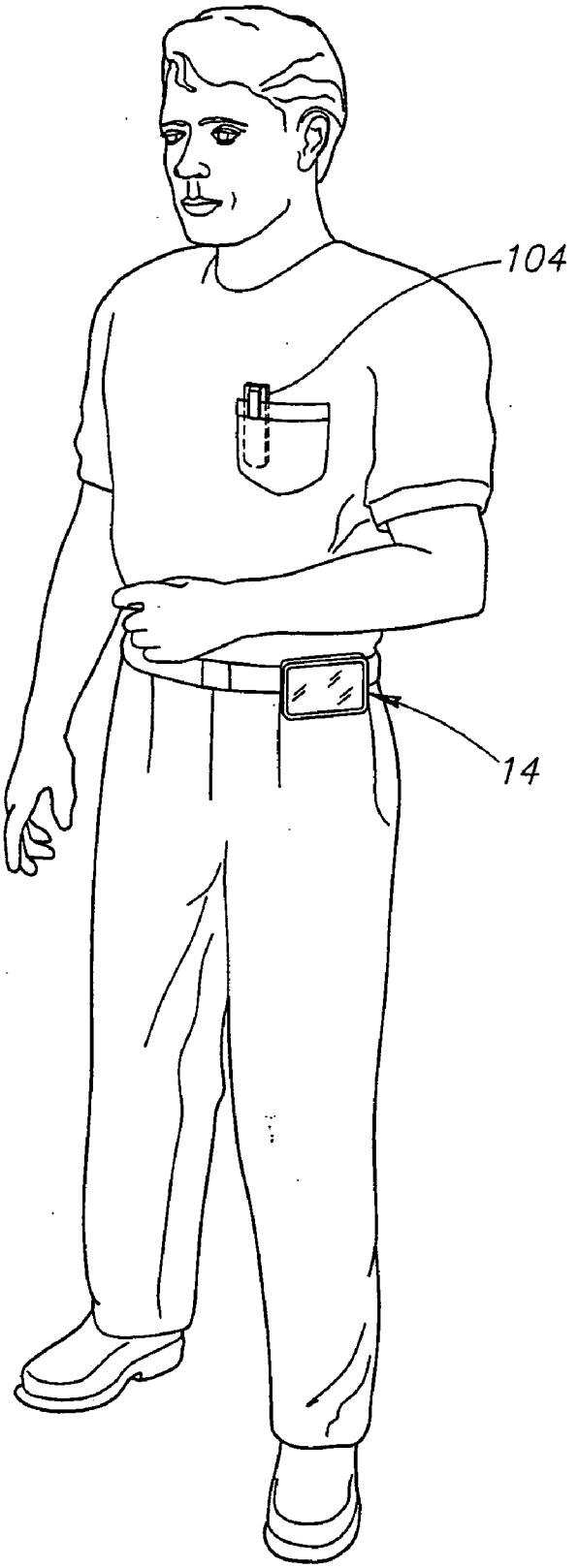


FIG.12

USER INTERFACE FOR ELECTRONIC DEVICES

PRIORITY CLAIM

[0001] This application claims the benefit of U.S. Provisional Application 60/641,652, filed Jan. 4, 2005 and entitled USER INTERFACE FOR ELECTRONIC DEVICE.

FIELD OF THE INVENTION

[0002] This invention relates generally to electronic devices and, more specifically, to a new and improved user interface for electronic devices and methods of incorporating the same.

BACKGROUND OF THE INVENTION

[0003] One of the constant challenges in this technological age is how to control the increasingly complex electronic devices used in everyday life. While different types of electronic devices have different levels of functionality and thus require different levels of interface complexity, many problems are fundamental to all such devices. For example, electronic devices such as audio equipment typically require incorporation of various controls accessible by users in order to direct the functionality of the audio equipment. These controls include buttons, knobs, toggles, dials, switches, or other user interface devices. These controls, in turn, allow the user to access equipment functionality such as select equipment mode (e.g., switching from CD player to radio), radio station tuning, alarm set-up, audio track play sequence, and recording.

[0004] As electronic devices have increased in sophistication, more and more functions are necessary to control these devices. This has necessarily required the integration of more controls into the devices. With an increase in the number of controls has come a frequent corresponding increase in the confusion experienced by device users as they struggle to learn, program, use and reprogram the controls to achieve the desired functionality of the devices. Users often experience difficulty in locating the buttons to control the desired functionality caused by too many or poorly labeled buttons. Often multiple controls must be activated in sequence or simultaneous to achieve desired functionality. Other controls are required to be continuously operated to maintain certain functionality. In general, it is also difficult to obtain user feedback on the operation of the controls and instruction manuals are often missing, incomplete or incomprehensible.

[0005] Accordingly, there is a need for an improved user interface for electronic devices and methods of incorporating the same that minimizes the number of controls required to achieve the desired functionality, improves the ease with which the controls can be programmed and in general makes the control system more user friendly, all while not sacrificing the scope of functionality required in modern electronic devices.

SUMMARY OF THE INVENTION

[0006] A system according to the invention includes an electronic device having a case housing an operative portion, such as a sound system, CD Player, or the like. A bay is formed in the case and includes a communication channel interface electrically coupled to the operative portion. The system further includes a portable computer, such as a personal digital assistant (PDA). The portable computer is sized to fit within the bay having a communication channel thereof in data communication with the communication channel interface. The portable computer includes a processor and a memory for executing and storing applications, respectively. Applications stored by the portable computer include control applications programmed to generate control signals in response to user inputs. The control signals are transmitted to the operative portion which responds to the control signals by playing music, adjusting a volume level, and the like. A touch screen is provided displaying an interface to the control applications. A user provides inputs to the portable computer by means of the touch screen.

[0007] The portable computer may also store a media application programmed to interpret media data and to generate an output interpretable by the operative portion to generate at least one of audio, pictures, and video. The media data operated on by the media application may be stored in the portable computer or stored in external memory selectively placed in data communication with the portable computer.

[0008] The portable computer may store a scheduling application programmed to receive a schedule. The scheduling application interprets the schedule and invokes the control application to cause the operative portion to perform a function according to the schedule.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Preferred and alternative embodiments of the present invention are described in detail below with reference to the following drawings.

[0010] **FIGS. 1A through 1C** are perspective views of an electronic device having an interface, in accordance with an embodiment of the present invention;

[0011] **FIG. 2** is a schematic block diagram of a system including an interface and an electronic device, in accordance with an embodiment of the present invention;

[0012] **FIG. 3A through 3C** are perspective views of an alternative embodiment of an electronic device having an interface, in accordance with an embodiment of the present invention;

[0013] **FIGS. 4A through 4C** are perspective views of an alternative embodiment of an electronic device having an interface, in accordance with an embodiment of the present invention;

[0014] **FIGS. 5A through 5C** are perspective views of an alternative embodiment of an electronic device having an interface, in accordance with an embodiment of the present invention;

[0015] **FIGS. 6A through 6B** are perspective views of an alternative embodiment of an electronic device having an interface, in accordance with an embodiment of the present invention;

[0016] **FIGS. 7A and 7B** are perspective views of an alternative embodiment of an electronic device having an interface, in accordance with an embodiment of the present invention;

[0017] **FIGS. 8A through 8C** are perspective views of an alternative embodiment of an electronic device having an interface, in accordance with an embodiment of the present invention;

[0018] **FIGS. 9A through 9C** are perspective views of furniture having embedded electronic devices having an interface, in accordance with an embodiment of the present invention;

[0019] **FIG. 10** is a perspective view of a house having various systems controlled by an interface, in accordance with an embodiment of the present invention;

[0020] **FIG. 11** is a perspective view of a wrist mounted sensor having a separate interface, in accordance with an embodiment of the present invention; and

[0021] **FIG. 12** is a perspective view of a pocket mounted sensor having a separate interface, in accordance with an embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0022] Referring to **FIGS. 1A through 1C**, an apparatus **10** includes a case **12** housing an electronic device such as a sound system, CD player, radio, alarm, cassette player, MP3 player, or the like. The electronic device may include other types of electronic systems that require a variety of controls, ranging from computer electronics to household appliances. The case **12** may be configured for desktop use, wall mounting, or portability, and may be configured to work with any combination of other mono, stereo or multi-channel equipment and speakers.

[0023] In some embodiments the case **12** comprises multiple portions such as portions **12***a*, **12***a* housing speakers and a portion **12***c* housing control and signal generating portions. An interface **14** secures to the case **12** and may be include a touch screen, combined screen and key pad, or the like. In the illustrated embodiment, the interface **14** is a portable digital assistant (PDA). In the embodiment of **FIG. 1B**, the interface **14** removably secures within a bay **16** secured to, or formed in, the case **12**. In some embodiments, a chord **18** extends from within the bay **16** and is connectible with the interface **14** to transmit signals. In still other embodiments, a socket or plug within the bay **16** engages a plug or socket, respectively, on the interface **14**. In the embodiment of **FIG. 1C**, a wireless communication port **20** secures to the case **12**. The interface **14** likewise includes a communication port **22**. The communication ports **20**, **22** may be an infrared port, BlueTooth, 802.11b, 802.11g, or GPRS communication port, or the like. In some embodiments the interface **14** communicates with the communication port **20** while positioned within the bay **16**, whereas in others, a socket or plug is provided for communication while the interface **14** is within the bay **16** and the communications port **20**, **22** are used only when the interface **14** is removed from the bay **16**.

[0024] Referring to **FIG. 2**, the interface **14** includes a processor **24**, input/output devices **26**, memory **28**, and a display **30**. The input/output devices **26** may include systems for communicating with other devices and for receiving user inputs. The devices **26** may include serial, parallel, USB, and Firewire ports as well as wireless communication devices. The devices **26** may also include a key pad and other buttons facilitating user interaction with the interface **14**.

[0025] The memory **28** stores an operating system and a plurality of applications executable by the processor **24**. The interface **14** may store applications such as a calculator, calendar, and electronic reference books such as dictionaries and encyclopedias. Applications may include media applications **32** programmed to interpret media data **33** stored in the memory **28**, or in external memory made accessible to the media applications **32**, and generate data convertible into audio and/or video signals provided to an electronic device **36**. Media data **33** may include audio and video files in various formats. External memory may include memory cards, CDs, and the like. In some embodiments, media data **33** is stored and played on the electronic device **36** such that media applications **32** are not necessary.

[0026] The applications may also include control applications **34**. Control applications **34** enable the interface **14** to generate control signals interpretable by the electronic device **36**. Control applications **34** may generate a user interface on the display **30** and receive user inputs by means of the input/output devices **26**. In one embodiment, the display **30** is a touch screen both displaying information and receiving user inputs. The control applications **34** translate the user inputs into control signals provided to the electronic device **36**.

[0027] The control application **34** for a particular application may also store a user manual. Access to the user manual may vary based on a predetermined configuration or user preference. For example, the applicable portion of the user manual may be displayed on the touch screen as each control is pressed, describing the control functionality and programming options. Alternatively, the user manual may be interactive, and displayed only to notify the user that incorrect options were selected, and to give the user additional options. In another example, the user manual may be used to guide the user through a predetermined sequence of steps to setup or control either the user interface or associated electronic device.

[0028] The control applications **34** may be programmed to display only user interface elements, such as buttons, invoking functions that are currently a by the electronic device **36** being controlled, or selected for control. Thus, confusion that results from interfaces having too many small buttons is reduced. In some embodiments, the control applications **34** are programmed to display interface elements in a larger than normal size upon receiving an input from a user in order to accommodate users having limited eye sight.

[0029] The electronic device **36** typically includes a control module **38**, an input/output module **40**, and one or more functional modules **42**. The control module **38** receives control signals from the interface **14** to control operation of the electronic device **36**. Control signals may control such functions as activation, deactivation, volume control, CD track selection, input selection, and the like. In input/output module **40** handles communication with the input/output devices **26** of the interface **14**. Functional modules **42** execute the functions dictated by the control signals. In embodiments where the electronic device **36** is a sound system the functional modules **42** are typically operable to produce music and perform related functions.

[0030] The memory **28** of the interface **14** may also store applications enabling networking to other computers, either locally or across the Internet. In such embodiments, the interface **14** would allow the user to view information associated with networked computers and other devices. The interface **14** would be able to download and upload data such

as a daily schedule (e.g., to function as a sophisticated alarm clock to remind the user for multiple important events in any pattern), audio and video files (e.g., songs, music and video clips) and photographs and images (e.g., to be displayed as a screen saver or a slide show). The interface **14** may also connect via wired or wireless communication to the Internet to allow the user to surf the web and send/receive email.

[0031] The interface **14** may include a microphone, camera and/or video, and speaker capability that allows independent capture and playback or display of audio and video, as well as communication of captured audio and video to the electronic device **36** for presentation. For example, if the electronic device **36** is a stereo system, the interface **14** with a microphone could be used to record a voice memorandum that is communicated to the stereo system for broadcast using the stereo system speakers. Once captured, the audio or video could be stored, instantly replayed, cataloged for association with different users, and transmitted to other networked computers or on the Internet.

[0032] The interface **14** may independently or through the associated electronic device **36** be used to play video games. For example, the user may access and play video games through a touch screen user input device integrated with the interface **14** of the present invention. In this embodiment, a manipulation device (e.g., stylus), could be used to control game play. Alternatively, an external device such as a joystick could be connected to the interface **14** or electronic device via an input port such as a USB port.

[0033] Referring to **FIGS. 3A through 3C**, the interface **14** may be positionable within a bay **16** formed on an angled surface **44** formed in the case **12**. Referring to **FIGS. 4A through 4C**, in an alternative embodiment, the case **12** is substantially planar having a thickness much less than the height and width thereof Referring to **FIG. 5A through 5C**, in some embodiments the case **12** is adapted to be portable having a handle **46** and a round cross section. The bay **16** may be formed in a planar portion tangent to, or extending outwardly from, the remainder of the case **12**. Referring to **FIGS. 6A through 6C**, in still other embodiments, the interface **14** secures to a bay **16** formed on an edge of a substantially planar case **12** having a height substantially less than the width and length thereof. In the embodiment of **FIGS. 6A through 6C**, the bay **16** may be embodied as a cutaway portion extending through the entire thickness of the case **12**.

[0034] Referring to **FIG. 7A**, the electronic device **36** may be embodied as a DVD player coupled to a television set **48**. In the embodiment of **FIG. 7B**, the electronic device **36** may be embodied as the television set **48** and the interface **14** may further include a DVD player, DVD recorder, or flash memory storing media to be displayed on the television **48**. The interface **14** wirelessly transmits the content of the DVD player or other memory device to the television **48** to be displayed. As in other embodiments, the interface **14** functions as a controller of the television set **48** permitting users to provide inputs by means of input/output devices **26** or a display **30** embodied as a touch screen. In such embodiments, media applications **32** may include DVD playing software, other video file playing software, video editing software, internet browsers and the like.

[0035] Referring to **FIGS. 8A through 8C**, the electronic device **36** may be embodied as a projector **50** having a case **12** with a bay **16** for receiving the interface **14**. In the illustrated embodiment, the bay **16** is formed on a truncated corner **52** of the case **12**. As in other embodiments, the interface **14** may provide both control signals and media content to the projector **50**.

[0036] Referring to **FIGS. 9A and 9B**, the interface **14** may secure to a case **12** formed in, or secured to, a reclining chair **54** (**FIG. 9A**) or bed **56** (**FIG. 9B**) having a plurality of speakers **58** secured thereto, such as by means of arms **60** extending from the chair **54**. The interface **14** may likewise secured to an arm **60** extending from the chair **54**. The chair **54** may include an armrest **62** having a media player **64** embedded therein. The interface **14** may connect to the media player **64** wirelessly or by means of connecting wires extending therebetween. The chair **54** or bed **56** may have automatic massaging elements embedded therein having the controls thereof connected to the interface **14** such that the interface **14** may be used to initiate and terminate massages and change the parameters thereof. Referring to **FIG. 9C**, in some embodiments a sensing mat **66** secures is laid on the bed **56** to measure vital signs. The sensing mat **66** is connected to the interface **14**, by a cable or wirelessly, such that results may be stored and progress monitored. The mat **66** may sense blood pressure, heart rate, breathing rate, blood oxygen, temperature, body heat, motion (e.g. by means of radar, infrared, or video means), weight, carbon dioxide levels, moisture (e.g. sweat), sulphur dioxide, hydrogen sulphide or the like. Such measurements may enable medical professionals to discern, for example whether a patient is sweating and the temperature of a room should be adjusted.

[0037] Referring to **FIG. 10**, in some embodiments, the interface **14** hosts applications controlling devices in addition to audio-visual devices. For example, the interface **14** may control such items as exhaust fans **68**, ceiling fans **70**, air conditioners **72**, exterior lighting **74**, interior lighting **76**, phone and answering systems **78**, irrigation systems **80**, decorative lighting **82**, heating systems **84**, alarm systems **86**, surveillance systems **88**, desktop or notebook computer systems **90**, robots **92**, motorized blinds **94**, motorized windows **96**, electric door locks **98**, sensors **100**, and the like.

[0038] The interface **14** connects to the enumerated devices wirelessly or through the bay **16** formed in the housing **102** secured to a wall or like structure. The bay **16** may be connected with the various devices such that positioning the interface **14** within the bay **16** places the interface in data communication with the various devices. The bay **16** may house a computer programmed to control the various devices such that data sent between the bay **16** and the interface **14** need not include low level commands to the devices.

[0039] The control applications **34** of the interface **14** may interact with the devices to perform different functions such as direct a camera **88** to view a designated area, transmit video from a camera **88** over the internet, activate the robot **92** to perform a function, open and close blinds **94**, open and close windows **96**, lock or unlock a door lock **98**, contact police or the fire department, contact relatives, send messages over the internet, and the like.

[0040] In some embodiments, the sensors **100** are positioned inside or outside a building and provide inputs to the

interface **14** wirelessly or through the bay **16**. The sensors **94** may include motion sensors, air-pressure sensors, heat sensor (e.g. an infrared radiation sensor), temperature sensors, and the like. Applications executing on the interface **14** may process the outputs of the sensors **100** and enunciate alerts based thereon on the interface **14** and/or transmit alerts to other devices in order to provide notice to a third party such as a relative, the police department, a hospital, or a monitoring company.

[**0041**] In one example, the sensors **100** sense such events as a fire or heart attack. The application **34** interfacing with the sensors **100** may then cause the phone system **78** to phone emergency services. In some embodiments, a user may provide an input into the interface **14** causing the interface **14** to call emergency services. Upon sensing a heart attack or the like the interface **14** may be programmed to perform such things as open a window to allow in fresh air or adjust the temperature of the room. The interface **14** may direct the surveillance system **88** or a webcam to the location of a fire or a victim and send images or video to a third party. The interface **14** may also unlock the door lock **98** to permit emergency personnel to enter the building.

[**0042**] In the embodiment of **FIG. 10**, the memory **28** of the interface **14** may host a scheduling application accessible by a user to schedule operation of the various devices connected to the interface **14**. The scheduling application may be programmed to invoke applications corresponding to one or more of the devices in order to cause the devices to perform scheduled tasks. In some embodiments, the bay **16** hosts a computer executing a scheduling application that may be synchronized with the scheduling application of the interface **14**. In some embodiments, the scheduling application reviews items in a calendar or schedule and schedules other tasks in response thereto. For example, a wake-up alarm may induce the scheduling application to turn on the heating system **84** around the same time as the alarm.

[**0043**] Referring to **FIG. 11**, in one embodiment the interface **14** communicates with a wrist mounted sensor **104** sensing blood pressure, heart rate, blood oxygen, temperature, body heat, motion (e.g. by means of radar, infrared, or video means), weight or the like. The wrist mounted sensor **104** communicates this data to the interface **14**, which may then forward the data wirelessly such as by cell phone networks or wireless Internet. The Interface **14** may also display the information on the display **30**. Applications executing on the interface **14** may also analyze the data and provide audible, visible, or vibrational warnings in response thereto. Warnings may be displayed on or otherwise enunciated by the interface **14** and may be transmitted to another device to provide notice to a relative, the police department, a hospital, or a monitoring company. Referring to **FIG. 12**, in an alternative embodiment, the sensor **104** clips to the shirt or other clothing of a user, similar to a pen or like device. The interface **14** may also include a clip such that it may be clipped to the belt or other clothing of a user. The sensor **104** may be embodied as a microphone transmitting the user's voice to an interface **14** embodied as a wireless phone. In such embodiments, the sensor **104** may include a speaker receiving audio signals from the interface **14**. The speaker may likewise play music transmitted from the interface **14**.

[**0044**] While the preferred embodiment of the invention has been illustrated and described, as noted above, many changes can be made without departing from the spirit and scope of the invention. Accordingly, the scope of the invention is not limited by the disclosure of the preferred embodiment. Instead, the invention should be determined entirely by reference to the claims that follow.

The embodiments of the invention in which an exclusive property or privilege is: claimed are defined as follows:

1. An electronic system comprising:

an electronic device comprising:

a case housing an operative portion responsive to control signals and a transducer coupled to the operative portion to receive output signals therefrom and convert the output signals into a perceptible form;

a communication channel interface electrically coupled to the operative portion; and

a portable computer comprising:

a processor for processing operational and executable data structures;

a communication channel operably connected to the processor to carry information to and from the processor;

an input device for receiving user inputs; and

a memory for storing operational and executable data structures, the memory operably connected to the processor and storing a plurality of applications executable by the processor, at least one of the applications being a control application configured to generate control signals executable by the operative portion in response to the user inputs;

the portable computer selectively positionable having the communication channel in data communication with the communication channel interface.

2. The electronic system of claim 1, wherein the memory further stores a media application, the media application configured to interpret media data to generate an output interpretable by the operative portion to generate at least one of audio, pictures, and video.

3. The electronic system of claim 2, wherein the memory stores media data readable by the media application.

4. The electronic system of claim 1, wherein the memory further stores a scheduling application programmed to store a schedule and invoke the control application according to the schedule.

5. The electronic system of claim 1, wherein the electronic device is a sound system.

6. The electronic system of claim 1, wherein the input device is a touch screen.

7. The electronic system of claim 1, wherein the communication channel is a wireless communication device.

8. The electronic system of claim 7, wherein the communication channel is an infrared communication device.

9. The electronic system of claim 1, wherein the case further comprises a bay having the communication channel interface proximate thereto, the portable electronic device positionable within the bay having the communication channel in data communication with the communication channel interface.

10. A method for controlling an electronic device, the method comprising:

providing an electronic device comprising: a case housing an operative portion responsive to control signals and a transducer coupled to the operative portion to receive output signals therefrom and convert the output signals into a perceptible form, and a bay having communication channel interface electrically coupled to the operative portion;

providing a portable computer comprising an input device for receiving user inputs, and a memory for storing operational and executable data structures, the memory operably connected to the processor and storing a plurality of applications executable by the processor, at least one of the applications being a control application configured to generate control signals executable by the operative portion in response to the user inputs;

inserting the portable computer into the bay having the processor in data communication with the operative portion;

receiving user inputs into the input device;

generating control signals corresponding to the user inputs;

transmitting the control signals to the operative portion; and

executing at least one function corresponding to the control signals.

11. The method of claim 10, wherein the memory further stores a media application, the method further comprising executing the media application to interpret media data to generate an output interpretable by the operative portion to generate at least one of audio, pictures, and video; and transmitting the output to the operative portion.

12. The method of claim 9 wherein the memory stores media data readable by the media application.

13. The method of claim 10, wherein the memory further stores a scheduling application, the method further comprising generating a schedule and invoking the control application according to the schedule.

14. The method of claim 10, wherein the electronic device is a sound system.

15. The method of claim 10, wherein the input device is a touch screen.

16. The method of claim 10, wherein the communication channel is a wireless communication device.

17. The electronic system of claim 16, wherein the communication channel is an infrared communication device.

18. An electronic system comprising:

a monitor comprising a sensor selectively contacting a user to sense a condition and a communication channel operable to transmit a sensor output from the sensor;

a portable computer comprising:

a processor for processing operational and executable data structures;

an input port operably connected to the processor to carry information to and from the processor, the input port selectively in data communication with the communication channel;

an input device for receiving user inputs; and

a memory for storing operational and executable data structures, the memory operably connected to the processor and storing a plurality of applications executable by the processor, at least one of the applications being a monitoring application configured to receive the output and at least one of archive the output and generate an alert in response thereto;

the portable computer selectively in data communication with the operative portion to receive the output thereof.

19. The electronic system of claim 18, wherein the sensor is a heart rate monitor.

20. The electronic system of claim 18, wherein the sensor is mounted in a wrist mounted device and wherein the communication channel comprises a wireless communication channel.

21. The electronic system of claim 18, wherein the sensor is mounted to a clip mountable to clothing and wherein the communication channel comprises a wireless communication channel.

22. The electronic system of claim 18, wherein the portable computer is a portable digital assistant.

23. The electronic system of claim 18, wherein the sensor is mounted in a mat overlaying a bed.

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